

Claims

1. A thin film magnetic head device comprising:  
a reading thin film magnetic head element whose electric equivalent circuit is expressed by a series circuit of an equivalent voltage source and a series resistor having a resistance  $R_H$  and a parallel capacitor having a capacitance  $C$  and connected in parallel with said series circuit;  
an inductor having an inductance  $L$  connected in series with said series resistor; and  
a parallel resistor having a resistance  $R$  and connected in series with said parallel capacitor;  
wherein said resistance  $R_H$  of the series resistor, capacitance  $C$  of the parallel capacitor, inductance  $L$  of the inductor and resistance  $R$  of the parallel resistor are set to such values that a frequency characteristic of the reading thin film magnetic head element is extended toward a high frequency range.
2. The thin film magnetic head device according to claim 1, wherein an angular frequency  $\omega_0$  determined by the capacitance  $C$  of the parallel capacitor and the inductance  $L$  of the inductor ( $\omega_0 = 1/(LC)^{1/2}$ ), an angular frequency  $\omega_1$  determined by the capacitance  $C$  of the parallel capacitor and the resistance  $R$  of the parallel resistor ( $\omega_1 = 1/CR$ ) and an angular frequency  $\omega_H$  determined by the capacitance  $C$  of the parallel capacitor and the resistance  $R_H$  of the series resistor ( $\omega_H = 1/CR_H$ ) satisfy a condition of  $\omega_0 > \omega_1$  and  $\omega_0 > \omega_H$ .
3. The thin film magnetic head device according to claim 2, wherein conditions of  $\omega_0 \gg \omega_1$  and  $\omega_0 \gg \omega_H$  are satisfied.
4. The thin film magnetic head device according to claim 3, wherein said reading thin film magnetic head element is formed by a giant magneto-resistive element.
5. The thin film magnetic head device according to claim 4, wherein said reading thin film magnetic head element is formed by a tunneling type giant magneto-resistive element having a free layer, an insulating layer, a pin layer, an anti-ferromagnetic layer stacked in this order, and said thin film magnetic head device further comprises first and second electrode layer connected to said free layer and pinned layer, respectively.
6. The thin film magnetic head device according to claim 5, wherein said

01150 (2001-102)

inductor is formed by a microstrip line which is formed in one of said first and second electrode layers, and said parallel capacitor is formed by said first and second electrode layers and an insulating layer provided between the first and second electrode layers.

7. The thin film magnetic head device according to claim 6, wherein said first and second electrode layers are made of an electrically conductive magnetic material such that said first and second electrode layers serves as magnetic shield layers.

8. The thin film magnetic head device according to claim 4, wherein said thin film magnetic head device is formed as a combination type thin film magnetic head device including a reading giant magneto-resistive element and a recording inductive type thin film magnetic head element, said reading giant magneto-resistive element and recording inductive type thin film magnetic head element being stacked one on the other on a substrate.

9. The thin film magnetic head device according to claim 8, wherein said reading thin film magnetic head element is formed by a tunneling type giant magneto-resistive element having a free layer, an insulating layer, a pinned layer, an anti-ferromagnetic layer stacked in this order, and said thin film magnetic head device further comprises first and second electrode layer connected to said free layer and pinned layer, respectively.

10. The thin film magnetic head device according to claim 9, wherein said inductor is formed by a microstrip line which is formed in one of said first and second electrode layers, and said parallel capacitor is formed by said first and second electrode layers and an insulating layer provided between the first and second electrode layers.

11. The thin film magnetic head device according to claim 10, wherein said first and second electrode layers are made of an electrically conductive magnetic material such that said first and second electrode layers serves as magnetic shield layers.